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(71) Applicant: NEC CORP

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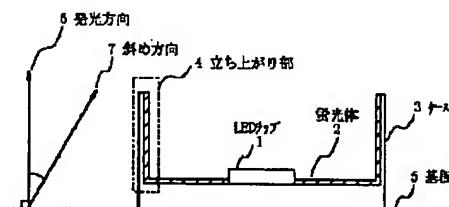
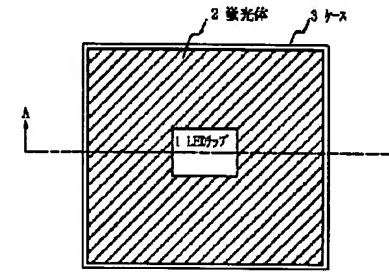
(54) LED DISPLAY ELEMENT AND DISPLAY APPARATUS

(57) Abstract:

PROBLEM TO BE SOLVED: To enable the surface emission by using an LED chip to be a point light source, and increase the aperture ratio of the emission plane by placing the LED chip to be a light emitting element in a recessed case having an opening structure and applying a phosphor on the inner wall of the recessed case having the opening structure.

SOLUTION: An LED chip 1 to be a point light source is disposed in a recessed square case opened at the top, a phosphor 2 is coated on the inner wall of the recessed case 3, the LED chip 1 is disposed at the bottom of the recessed case 3, and the phosphor 2 is applied on the entire inner wall of the recessed case 3. The LED display element emits a light in a direction 6 perpendicular to the surface of a board 5 holding the case 3.

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(71) Applicant: **KYOCERA CORP**

(22) Date of filing: **28.06.02**

(72) Inventor: **YAMADA RYUJI  
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(54) **LIGHT-EMITTING DIODE**

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(57) Abstract:

**PROBLEM TO BE SOLVED:** To provide a light-emitting diode, which has simplified manufacturing steps, improved manufacturing yield, and a spectroscopic characteristic that enhances the efficiency of the light utilization.

**SOLUTION:** The light-emitting diode comprises a spectroscopic material member 33, in which a fluorescent substance 32 is mixed in a transparent substance 31, and a semiconductor light-emitting element 34. The semiconductor light-emitting element 34 and the spectroscopic material member 33 are separated to constitute the diode such that they are arranged to keep a prescribed mutual distance. The spectroscopic material member 33 is coated with an optical thin film 51 that transmits the light ray radiated by the semiconductor light-emitting element 34 and reflects a part of the light ray which is radiated by the fluorescent substance 32 and proceeds toward the semiconductor light-emitting-element side so that the reflected light ray proceeds in the forward direction.

